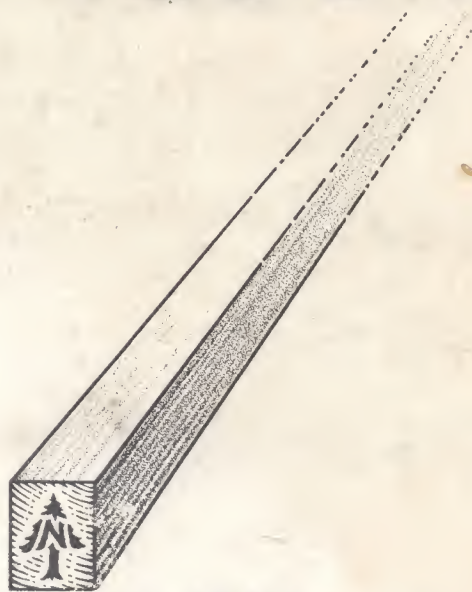


LUMBER  
AND ITS  
UTILIZATION



# WOOD FLOORS



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## *PREFACE*

**T**HIS booklet on Wood Floors has been prepared to meet the increasing demand for information on wood floors for interiors. A concise presentation is given on the various factors which make wood a successful flooring medium. This is followed by a brief description of wood floor construction, touching on the essential details, with a section on the different available woods for floors. Tables are included to show the commercial grades and sizes of flooring lumber in several popular woods. Short sections follow on laying and finishing the wood floor.

The subject of outdoor floors and heavy duty floors will be treated in a forthcoming booklet.

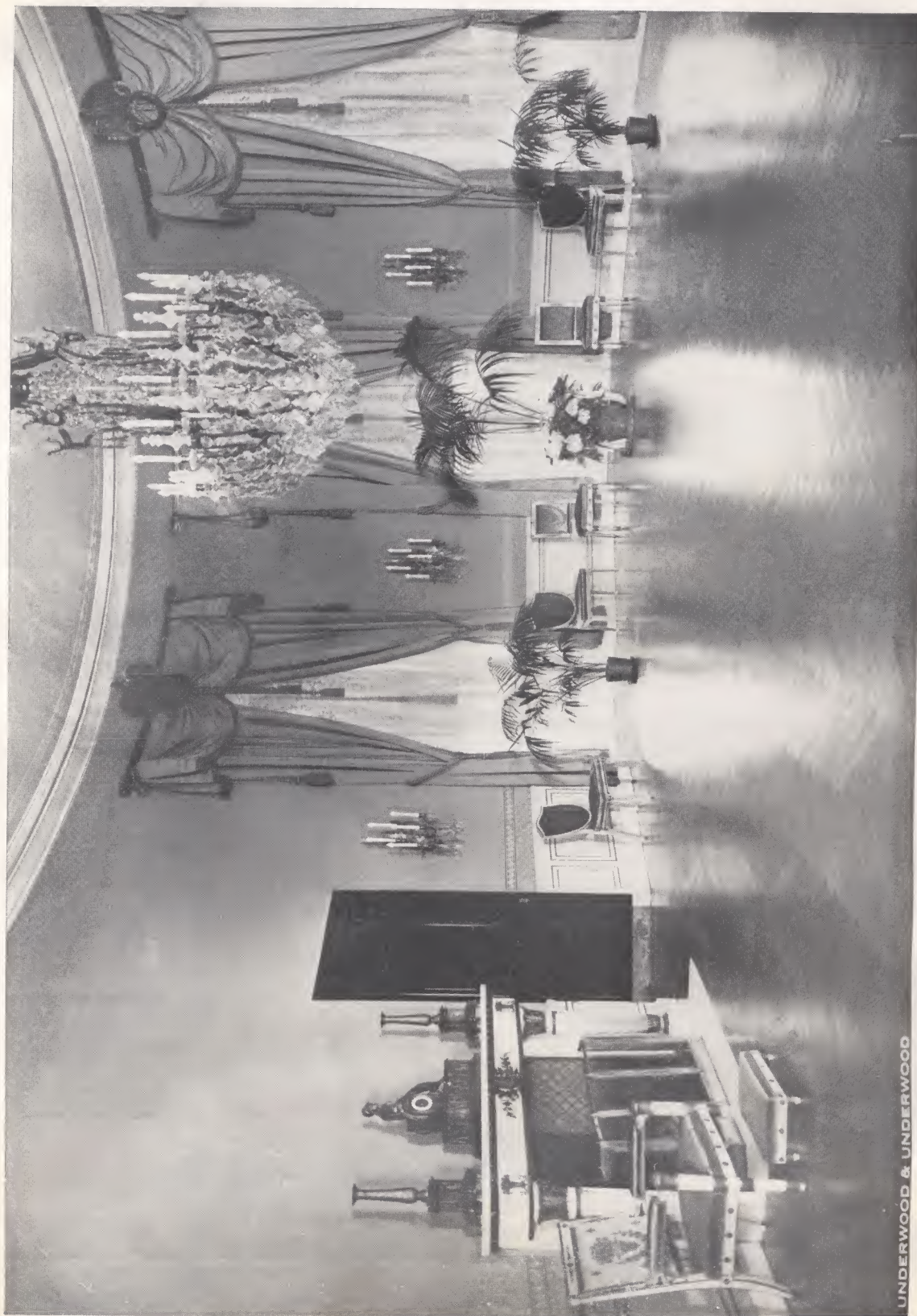
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UNDERWOOD & UNDERWOOD

Courtesy Harwood Manufacturers Institute

Where Diplomacy, Society, and Statecraft foregather and appointments, particularly the ever noticeable flooring, must be unobtrusively and impeccably correct. The floor of the Blue Room, the main reception room of the President's Mansion in Washington.



## WOOD FLOORS\*

FOR many centuries wood has been the favored material for flooring. Whether it was for a brilliant ballroom in the palace of a decadent Louis, or for the flooring of a sturdy bridge to span the Thames, wood was the choice and serviceable medium. Through the years it has continued to demonstrate its superiority, until now, with the benefits of modern improvements in seasoning and manufacturing lumber products, and with the artistic developments in color harmony through staining and tinting, wood has attained an unchallenged position as the flooring material for the home, the office, the club, the beach promenade and all other places where floor comfort and elegance are prized. At the same time, due to its serviceableness and economy, as well as its lightness combined with strength and durability and its insulating qualities, wood has also achieved an enviable position as the preferred material for heavy duty floors in industrial buildings, loading platforms, boardwalks, bridge floors and other similar services.

Probably one of the chief reasons for the popularity of wood is the diversity of characteristics to be found among the various species and types of flooring. No matter which one of the many different forms of floors or floor surfaces it is desired to build, lumber from one or more species of wood is available to conform to the most exacting requirements.

Simple and economical to construct, strong and serviceable, and capable of the most beautiful finishes, the wood floor in the home remains supreme. Various substitutes make sporadic appearances on the market and, due partly to their novelty and partly to vigorous merchandising, attain a certain vogue, but the exacting, impartial test of service and experience invariably indicates their fundamental unfitness for the floor in a home.

### Wood Floors Warm and Dry

No one really desires any kind of stone floor in his home today. Such a chilly relic of the

medieval castle makes slight impress on the mind of the modern home buyer. Warmth and comfort and a certain definite, if intangible, atmosphere of coziness and snugness are desired and are naturally associated with the wood floor, for it is with the wood floor alone that these essentials to ease and comfort can be obtained. Who can not recall the oft-repeated childhood admonition, "Don't sit on those damp stones—you'll catch your death of cold!"? Anyone who has ever had occasion to walk over a stone floor in his bare feet can never be persuaded to have such floors in any place except the bath or cellar.

House floors of wood are warm and dry. Contact with them does not cause a sensation of dampness and chilliness. The inch-and-a-half thickness of lumber in the sub-flooring and finished floor, with a layer of substantial building paper between, presents an effective barrier to the passage of air and moisture. Wood is naturally an excellent insulating material, so that with an all-wood floor, the home owner obtains the warmest and driest type of construction that is justified for the purpose. Coughs and colds and more serious diseases will be found less prevalent in homes which have warm, dry floors.

### Beauty of Wood Floors

Many other considerations in addition to those of health and comfort enter into the selection of the finished floor. The floor is the background for the decorative motif which envelops the home. With the modern trend toward colors, nothing of bleakness can be permitted. The constant aim is to develop an attractive atmosphere. The first step in this direction is the use of a flooring with a character and a tone into which the artistic features of the walls and furniture and of a few well-placed rugs can blend easily and naturally.

What is it that gives character to a floor surface, thus avoiding an impression of monotony?

Several elements such as pattern, texture, depth and color contribute in varying degree. Wood, like all of nature's handiworks, has its own distinctive pattern or grain, which can be viewed with pleasure by the most critical eye.

---

\* Prepared by N. S. Perkins, C. E., Staff Engineer.



Here there is no mechanical attempt to avoid uniformity by a pattern of artificial checks and squares; instead the ever-varying growth rings, with their variations in shade and width, create the inimitable texture of wood.

The appearance of "depth" in wood is due to reflection of light in different directions from the small particles in the material. It is especially observable in well-polished wood floors where it

ety of colors is available, ranging from the natural soft shades of yellow and golden brown, through darker browns, greens and blues, to shades of opal, gray and even ebony, yet through them all the delicate texture shows as clearly as in the natural wood. They defy all imitation but are within easy reach of the modest pocketbook. They add dignity and refinement without any touch of the bizarre.



*A modern reproduction of old Colonial random width oak plank. The pegs with which such floors were once fastened, are faithfully reproduced in that above, but serve merely to cover the screws which actually hold the planks in place.*

contributes much to the attractiveness of the room.

Certain flooring and varnish manufacturers, recognizing the needs of the architect and interior decorator, have perfected extremely beautiful tints and colors for both oak and maple. These colors penetrate into the wood fibers so that the exquisite graining of the species is brought out with remarkable clearness. A vari-

One of the modes in flooring which has been recently introduced by architects is the wide oak plank with oak pegs. The planks, of course, are securely nailed or screwed in place, the pegs serving only to imitate the old-time method of fastening a floor to the joists. Wide planks are occasionally used in walnut.

Beauty in wood floors is not confined to any species, although certain woods may lend them-



selves more readily to coloring processes than others. Southern Pine, Douglas Fir, Western Larch, and West Coast Hemlock, particularly in the edge-grained stock of these species, and Birch and Beech, as well as Oak and Maple, all make excellent and attractive flooring materials, each of which has its own individual character and charm.

### Adaptability of Wood

The beauty and character of wood, and the exquisite colorings now applied to it by various flooring manufacturers, make the wood floor easily adaptable to any desired scheme of interior decoration. An old colonial floor, a highly polished ballroom finish, or an attractive parquetry—whatever the style or type—it is easily obtained in wood. The furnishings and trim of the room can be made to harmonize with the less conspicuous, but always noticeable, flooring, or, on the other hand, the wood floor can be designed to supply the particular color tone needed for the background against which the furnishings of the room are to be displayed.

### Wood Floors Resistant to Wear

Although warmth and beauty are attributes which any flooring must possess to be satisfactory, they alone are not sufficient. Durability and hardness, the ability to withstand the wear and tear of everyday life, must also be present. Wood has demonstrated its serviceableness in millions of homes, through hundreds of years. It has stood the test of time in a thousand different capacities. Probably few forms of tests are as severe as that of the modern bowling alley, yet the terrific pounding to which these alleys are subjected day and night leaves them practically unmarked.

The Mellon Institute has made tests to determine the wearing qualities and resistance to indentation of a number of flooring materials. The results are tabulated below, giving the percentage wear of the material under equivalent traffic conditions, and the degree of indentation.

Material	Abrasion Loss	Indentation
Vitreous tile .....	4.57	0
Marble .....	23.18	0
Maple wood .....	23.79	0
Rubber .....	20.59	4
Linoleum .....	56.57	13.6
Oxychloride cement .....	50.10	0
Neat Portland cement.....	16.79	0
Asphaltic composition .....	80.11	61.9
Cork tile .....	45.93	26.7

Unfortunately, these results have a limited application, since neither the Portland cement nor the maple can be considered as representative. The neat cement is a richer mix than is used in ordinary concrete, while the maple was not surfaced or treated and so was not as resistive as in normal service. Even so, it will be seen that maple showed a wearing quality practically equal to marble and a resistance against indentation unsurpassed by any material. The practical side of these indentation tests is to demonstrate how vastly superior a hard wood is to some of the softer flooring substitutes in resisting impressions from massive furniture on small legs or castors and the occasional dropping of sharp-pointed or heavy articles. Probably everyone has seen the deep holes left in various composition floorings by furniture which has stood in one position for a few months and then been moved to a new spot when a rearrangement was desired. Such scars are impossible with a wood floor, which can take concentrated loads up to almost 5,000 lbs. per square inch in the harder species, without crushing or deforming the fibers.

Because of this inherent resistance to wear and tear, well-finished wood floors last almost indefinitely. There are numerous examples which have been in constant service for over two hundred years. And these old floors did not have the protection of modern waterproof treatments, such as are patented features of several modern brands.

A striking example of the serviceableness of wood is the Southern pine floor at the shuttle transfer in the subway station at Times Square, New York City. Although this floor has been tramped over by over 800,000,000 persons during its life of almost eleven years, it is still in excellent condition; and good, apparently, for many more years of wear from scuffling feet. Yet this floor, like many of those of more ancient origin, has never been treated or protected in any way.

### Smoothness

One of the most popular qualities of a finished wood floor is its glossy smoothness. Young people and thoughtful parents, especially, are interested in this feature because of the dancing space provided in the home when wood floors are present. A few chairs are pushed back, a rug or two rolled up, and the ballroom is ready. A turn of





*An ideal treatment for a corridor or entrance way. To the serviceableness of wood flooring has been added the ornamentation of parquetry.*



the dial and the strains of the latest song hit drift into the room. No need then to hunt out a night club or a distant roadhouse.

Another advantage secured by the smooth, polished wood floor is the ease with which it may be cleaned. Housekeepers are especially appreciative of this property.

### Resiliency in Wood Flooring

The element of resiliency or elasticity may seem to be somewhat intangible and unimportant to the man or woman who has not experienced the steady pounding produced by constant walking over a cold, unyielding surface. Medical authorities, however, are pretty well agreed on the detrimental effects of such an experience if it is repeated frequently enough. In the home, the daily shock to the human system, although it might be negligible over a comparatively short period, would become eventually an actual menace to the health.

The Ohio State Board of Health in a survey conducted some time ago on "Industrial Health Hazards" stated:

"In summing up the chief factors which cause fatigue in the steady workers—who, as we have shown above, should never show symptoms of exhaustion—there are:

"(1) Laborious work, (2) long hours, (3) piece work, (4) speeding up, (5) monotony, (6) constant standing—constant standing upon cement, stone or brick floors should be provided against by supplying wood platforms or even plain boards upon which to stand \* \* \*."

In an article on "Feet, Floors, and Health," contributed to "The Nation's Health," in 1924, Dr. A. B. Emmons, 2nd, director of the Harvard Mercantile Health work, made some pertinent statements, credit for which was given to the Committee on Floors of the American Hospital Association. Speaking of three well known stone-like flooring mediums, Dr. Emmons stated:

"—, —, and — may look and wear well. They are cold and lack resiliency, tiring the feet. They are also somewhat noisy and dangerous if smooth. Slipping is common especially when moisture is present. \* \* \*

"Wood is good from a health and a safety point of view."

In a number of government hospitals, the medical authorities have refused repeatedly to sanction tennis courts with a hard, unyielding

surface for use of convalescent patients and hospital employees, simply because running and jumping on hard surfaces are considered prejudicial to health. Yet the world's leading tennis stars, throughout the winter months every year, play on indoor wood courts with never a thought of injury to their feet and without fear of jeopardizing their out-of-doors successes.

When the floor construction is of other materials than wood, as in large office buildings, it is generally covered with a wood floor set on "sleepers." In this manner much of the resiliency otherwise sacrificed is retained. This resiliency causes a cushioning effect underfoot and is inherent with all wood floors. It makes them comfortable to walk upon or to stand and work on. As a result wood floors are healthful and do not fatigue the users.

### Cost

One of the most significant items to the average person in choosing floor material is cost. In considering cost, ease of maintenance and length of life should not be overlooked, since these items directly affect the yearly cost to the owner. The long life of the wood floor is proverbial. Many such floors, in well known buildings have been in constant service for two hundred years and more. There can be no vestige of doubt concerning the ability of the all-wood floor, if reasonably well maintained, to last throughout the life of the home or office. The maintenance of a wood floor is a simple and economical matter. After the original coatings of shellac or varnish and wax, all that is required is an occasional waxing. If the service is unusually severe, as in a school room or other public building, wood floors may require special finishing methods or may have to be "done over" or re-varnished and waxed every few years.

With the items of maintenance and repair in its favor, it becomes evident that the comparatively low initial cost of a wood floor renders it the most economical type that can be installed. Most of the modernistic attempts at "something different" for the floor, only result in doubling or trebling the cost to the owner, out of all proportion to real or fancied advantages secured.

No building material stands still in popular favor. New use requirements develop with changing conditions and novel substitutes are proposed.

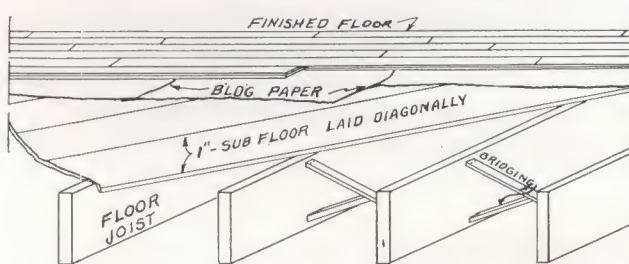


Even the most familiar materials must keep step with these changes. This, wood flooring has done. It possesses the fundamental advantages of warmth and resiliency under foot, a pleasing and often beautifully varied natural color pattern; physical characteristics of great strength, hardness, and durability. It has met the requirements of a new day by refinements in manufacture; by attractive combination of pieces into novel designs; and by colors which in variety and beauty transcend anything our fathers knew. The use of wood flooring is steadily on the increase, and with the improvements recently developed, promises to establish a new standard of beauty and comfort under foot.

### HOW TO MAKE A GOOD FLOOR

Like most other worth while things good wood floors are secured only by taking pains. Unsatisfactory floors may result from adverse conditions, or from ignorance or carelessness in the making.

In the residential types of buildings and in many other occupancies the accepted floor construction is of lumber joists or floor beams on which is laid first a sub-flooring and then a finished floor. (See Fig. 1.) This type of floor



WOOD FLOOR CONSTRUCTION

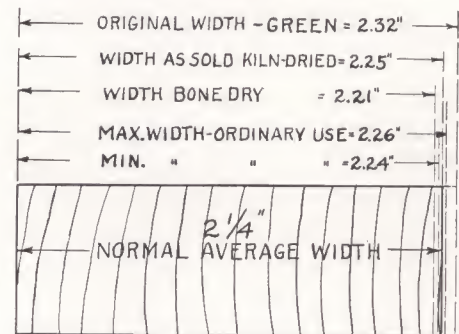
Fig. 1.

is used in countless residences, stores, and apartments. Following are the precautions which must be observed in its construction.

#### Use Dry Lumber

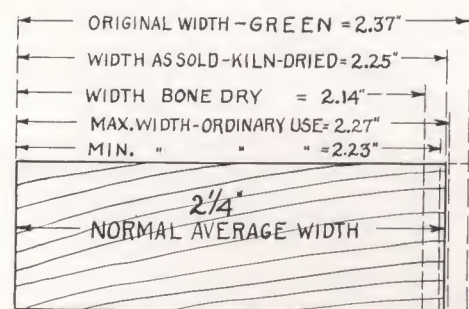
Only thoroughly seasoned lumber should be used. When lumber is first cut from the log it is green, i. e., it has a considerable amount of moisture in the wood fibres. As this moisture dries out the wood begins to shrink a little and will continue to do so until it has dried out as far as it can under the prevailing temperature and humidity to which it is exposed.

If the wood is dried in an oven until it is bone dry, it will shrink from 4 per cent to 9 per cent or an average of 0.15 inch in the width of a  $2\frac{1}{4}$ -inch flooring strip. (See Figs. 2 and 3.) Fortunately, flooring in actual use never becomes so dry, but varies from about 6 per cent to 12 per cent in moisture content from season to season.



SHRINKAGE IN  $2\frac{1}{4}$ \"/>

Fig. 2.



SHRINKAGE IN  $2\frac{1}{4}$ \"/>

Fig. 3.

If it is dried, when installed, to the average of this range or about 9 per cent, the change from summer to winter condition will be unnoticeable. It is only when green flooring goes into a building and subsequently dries out and shrinks, that the often complained-of cracks between strips occur. Insist upon dry lumber.

New discoveries in the treatment of wood flooring with oils and chemicals go far toward preventing even the slight "come and go" of well seasoned flooring. These treatments prevent wood from taking up or giving off moisture so rapidly under changing air conditions, and reduce the consequent change in width of flooring. A good grade of building paper between sub and finish flooring also helps to slow up moisture changes. Seasoned lumber, used in combination with either or both of these precautions, will



afford a thoroughly satisfactory floor and one which takes full advantage of the beauty and other valuable properties of wood.

### Size of Joists and Stiffness

The size of floor joists in the ordinary home is usually governed more by stiffness than by strength. In other words, a 2 x 6-inch joist might be strong enough to support the antici-

inch piece, though it is only about 1½ times as strong.

The grade of lumber used for floor joists is usually No. 1 Common. This is the best grade of two-inch "dimension" lumber generally available at lumber yards, and is well suited for the purpose. Joists graded on the structural rules can be had where greater strength is desired. Often it is desirable to use No. 2 Common grade and



*Courtesy The Mott Studios*

*A striking example of decorative possibilities in floors. This hardwood floor, cut to resemble rough hewn planks, is suitable for living room or shop and will harmonize with and enhance other ornamentation of the room.*

pated floor load in a certain room, but it might bend or vibrate under a heavy weight or footfall so as to cause a sag at the middle or to shake the whole room. To avoid this, a deeper joist, say 2 x 8 inches should be used. The stiffness of a joist increases in proportion to the cube of the depth, while the strength in bending varies as the square of the depth. This means that a 2 x 8-inch joist will be over twice as stiff as the 2 x 6-

to make the joists under the floor two inches deeper. The lower grade lumber has certain defects which make it less strong, size for size, than the higher grade; but it costs about the same as the higher grade in a lesser size; it is about as strong because of its greater depth; and it is much stiffer. It is well with either grade to turn the best edge of the joists downward. Knots along the top edge of a beam will not weaken it as much as knots on the bottom edge.



### Some Construction Details

Floor joists are usually spaced 16 inches on centers to coincide with the wall stud spacing. For heavy loadings, however, a 12-inch spacing may be used, while for light loadings, a 24-inch spacing may suffice.

Floor joists should be "sized" so as to give a level surface on which the sub-floor is nailed. The sub-flooring should be of one-inch boards, not wider than 6 or 8 inches. No. 2 Common grade of lumber is recommended for general use. Sub-flooring may be either matched (tongued and

tongued and grooved at the ends as well as along the sides. The end joints have been found by actual test (Forest Products Laboratory) to be sufficiently strong to avoid the necessity of having each joint occur over a joist. Consequently the joints may fall at random, providing only that no two adjacent strips have joints between the same two joists or beams.

No matter which type of sub-floor is employed, the strips should be laid diagonally. This has two advantages; first, the entire floor system and framework of the building is stiffened and braced,



*Courtesy Mattie E. Hewitt Studios*

*In this room vertical grain strip flooring showing the medullary or cross rays in addition to the grain patterns has been effectively used.*

grooved) or square edged, but the former is preferable, except that in moist climates, in summer homes not heated during the winter months, and in other buildings where the flooring may be exposed to considerable dampness, it is best to use square-edged boards for the sub-flooring and to leave about  $\frac{1}{8}$  to  $\frac{1}{4}$  inch between them to allow for any possible expansion from absorption of moisture.

In other cases, matched boards fitted together make a solid, warm underflooring. Some of the softwood manufacturers, notably of Southern pine, are making end-matched lumber. This is

and second, it permits laying the finished floor in either direction, i. e., parallel to the sides or to the ends of the room.

In certain temporary or very inexpensive structures where the chief object is to reduce the initial cost, finish floors are occasionally built without any sub-floor. This omission is seldom good economy. Much of the warmth, strength, and stiffness of the standard wood floor is thereby sacrificed. A sub-floor, moreover, eliminates play in the nails thus preventing any tendency towards squeaking. Another advantage of the sub-floor is that during the course of erection it offers





Courtesy Hardwood Manufacturers Institute

*A room to which wood has given true character. Here the random width plank flooring fits splendidly into the rugged English structural treatment.*





Courtesy Matte E. Hewitt Studios

*Simplicity and refinement subtly emphasized by finely textured block parquet*



workmen a safe working surface. The finished floor need not be installed and in fact should not be, until all plastering and finishing have been completed.

### Building Paper

An important element in the first class floor is a layer of heavy glazed and coated waterproof building paper, laid on the sub-floor with edges lapped at least three inches. This impervious layer keeps all moisture away from the bottom of the finished floor and so helps prevent expansion and warping of the surface.

the choice will probably be one of the hardwoods, either oak or maple. If the very finest floor is wanted, as in a hotel ballroom, many prefer the clear grade of quarter-sawed oak, obtained by sawing the log approximately across the diameter, or across the annual rings, so that the edge of the grain is presented as a wearing surface. Others will prefer the beautiful smooth finish of first grade clear maple. Individual taste, service requirements, and relative costs will be the deciding factors.

The producers of both of these floorings re-



*A novel combination effect. Two methods of flooring give this room attractiveness. Oak blocks, chemically treated, have been used with plain white oak strips.*

### THE FINISH FLOOR

After the sub-floor and building paper have been laid and all other interior work on the building done, it is time to lay the finished floor surface. A wide variety of species and textures of wood is available from which to choose.

### Hardwood Flooring

In the highest class of residence construction,

cently have perfected coloring processes, so that a pleasing variety of tints and color effects can be secured. Soft golden browns, silver grays, delicately shaded blues and yellows, as well as a distinctive black or green, offer a wide diversity of choice to the home-lover.

Several flooring manufacturers have put into effect processes for treating and finishing hard-





*Beech Flooring in a fine old New England home.—Eldred Mowery, Architect.*



wood flooring at the factory so that no further staining, varnishing or waxing need be done after the floors are laid. Some of these companies furnish strip and block flooring in various attractive patterns. One recent innovation is the use of black walnut strips for border designs around oak floors. These border strips simply replace corresponding strips of oak flooring and serve to enhance appreciably the natural beauty of the oak.

To secure an effect of ruggedness and simplicity good architects are now using random or varying width oak flooring reminiscent of the fine old colonial mansions in which similar floors are still in use. This type of flooring is readily secured at leading retail yards in large cities, or can be had elsewhere with little delay.

Maple flooring is produced chiefly in Wisconsin and Michigan, and is manufactured in both strips and parquetry. Beech and birch, two other hardwoods in popular use as flooring, are also produced chiefly in these two states. They are often mixed with maple where a uniformly light colored floor is not required.

Oak flooring is produced throughout practically the entire hardwood belt, extending from the Lake states south to the Gulf, and east through the Appalachian Mountains to West Virginia. The better known oak floorings are Appalachian oak, in either strip or parquetry, Southern oak in strips, blocks and parquetry, and Cellized oak, in strips and blocks, with many well known individual brands from each region.

Each of these floorings has its own individual merit, besides accuracy of manufacture, careful selection, proper seasoning, and beauty of grain. Cellized oak is so called because of its chemical treatment to protect the wood from decay and insect attack, and to reduce moisture changes. The block type is made up of several small pieces held together with steel splines.

Besides these four hardwoods there are others which make excellent flooring and are being manufactured for that purpose. Among them are tupelo, black gum, red gum, and, as previously noted, walnut.

### **Softwood Flooring**

In some part of the United States flooring of almost every important domestic softwood is used to a greater or less extent. Furthermore, flooring for some purpose is provided for in the

grading rules of every recognized association of lumber manufacturers. Kinds of wood available in manufactured flooring and generally used for residential and similar light duty purposes, are western red cedar, red cypress, Douglas fir, white fir, eastern hemlock, West Coast hemlock, western larch, Arkansas soft pine, North Carolina pine, Northern white pine, Norway pine, Southern pine, redwood, spruce, and tamarack. Some of these species, however, are used more for porch floors as in the case of western red cedar, red cypress, and redwood.

The softwoods, as the general term indicates, are, as a whole, not as hard as the hardwoods. Nevertheless, some softwoods are harder and more wear-resisting than some hardwoods used for flooring. Douglas fir, western larch, and Southern pine although not as hard as oak and maple, when manufactured in dense edge-grained stock, provide sturdy wearing qualities, present attractive graining, and are highly desirable for flooring. Other softwoods, while possibly not as hard, have qualities such as tenacity of fiber, that make them desirable for many flooring purposes as in kitchens covered by linoleum, summer cottages, attics, sewing rooms, children's playrooms, storerooms and closets.

All softwood floorings usually possess the advantage of comparatively low first cost; as a result, they are frequently chosen for the modest home or apartment house, and occasionally for even the finest residences, club rooms and dance floors.

When initial costs must be kept down, as in many low-priced speculative houses, flat-sawed flooring, in not the highest grades, is sometimes used. This type is also suitable for use under other flooring coverings.

Block flooring for residential or public building is also available in softwoods. Very attractive squares of Southern cypress with the end grain exposed are being made in limited quantities. An example of the effect produced appears on page 29.

Expert advice will be well worth while in selecting flooring materials. There are so many possibilities nowadays, in species and grades of wood to be used, in the width of squares and strips, in coloring, and even in final finish, that the judgment of the architect or retail lumber dealer is almost essential. The range of choice, and a rough idea of the suitability of grades and



species for different purposes, are illustrated in the following:

### GRADES AND SIZES

#### Oak

**Oak flooring** is produced in several grades of either quartered (edge-grained) or plain sawed stock, both red and white. The quarter-sawed oak is more durable in service, but is harder to cut and is more expensive.

**First grade red or white quartered oak** is recommended for high class residences, hotels, apartment houses, and club houses.

**First grade sap or second grade red or white quartered oak** is an economical substitute for the previous grade, where a dark finish is desired. These grades make a floor equally as durable as the first grade.

**First grade, red or white, plain sawed oak**—for high class residences, hotels, clubs, churches and schools.

**Second grade, red or white, plain**—for medium priced residences, hotels, and apartments, stores, office buildings, schools, etc.

**Third grade**—for cheap dwellings, tenements, high-class factories, etc.

#### Standard Sizes

Width, Inches	Thickness, Inches	Description
1½ face.....	13/16, ¾, and ½	Tongued and grooved at sides and ends.
2 face.....	13/16, ¾, and ½	
2¼ face.....	13/16	
1½ face.....	5/16	Square edged.
2 face.....	5/16	Square edged.
Special .....	5/16	Square edged.

13/16, ¾ and ½ inch represent nominal thickness. Finished thickness 1/32 inch less. ¾" and ½" may be had also in square-edge.

#### Amount of Oak Flooring Required, Board Feet

To the floor area in square feet, add the following percentages:

13/16 x 1½ .....	Add .....	50%
13/16 x 2 .....	Add .....	37 1/2%
13/16 x 2¼ .....	Add .....	33 1/3%
¾ x 1½ .....	Add .....	33 1/3%
¾ x 2 .....	Add .....	25%
½ x 1½ .....	Add .....	33 1/3%
½ x 2 .....	Add .....	25%

To the result add 3% to 5% to allow for waste in cutting and laying.

#### Nailing

13/16-inch flooring, use 8-penny steel cut light flooring nails.....	16 inches apart
½-inch flooring, use 6-penny bright wire finishing nails .....	8 inches apart
¾-inch flooring, use 4-penny bright wire casing nails .....	12 inches apart
5/16-inch square edged, use No. 16, 1½-inch barbed wire brads.....	8 inches apart

#### Maple, Beech and Birch

Maple flooring, and also beech and birch flooring, is manufactured in First, Second, and Third Grades.

The Maple Flooring Manufacturers Association recommends the following uses for these grades in maple, birch, and beech.

**First Grade:** Fine homes, apartments, churches, clubs, dance floors, athletic halls, roller skating rinks, schools, etc.

**Second Grade:** Nearly as serviceable as first grade, although permitting slight imperfections which might or might not be objectionable for use in same type of buildings listed under First Grade uses.

**Third Grade:** For factories, mills, warehouses, creameries, grill rooms, or rooms of antique design and decoration, or other places in which a firm and serviceable floor is wanted.

#### Standard Sizes

Width, Inches	Thickness, Inches	
1½, 2, 2¼, 3¼ face..	25/32 (standard)	Tongued and grooved on sides and ends.
2, 2¼, 3¼ .....	33/32, 41/32, and 53/32 (all special)	
1½, 2, 2¼ .....	¾, ½ and ⅝ (all special)	
2½, 3½ .....	25/32 and 33/32	Jointed flooring.

#### Amount of Maple Flooring Required, Board Feet

Width	Thickness	Thickness
	½, ⅝ and 25/32 inch	¾-inch
1½ face .....	50%	33 1/3%.
2 face .....	37½ %	25%.
2¼ face .....	33 1/3 %	22½ %.
3¼ face .....	24	Not made.
2½ face .....	20	Not made.
3½ face .....	15	Not made.

To the result add 3% to 5% to allow for waste in cutting and laying.

Thicker flooring is made from and measured as 1¼, 1½ and 2 inch lumber. Therefore, for flooring thicker than 25/32-inch, first determine the number of feet of 25/32-inch thickness required under the foregoing table and then,

add 25% for 33/32 inch thickness  
add 50% for 41/32 inch thickness  
add 100% for 53/32 inch thickness

#### Recommended Nailing

33/32 inch.....	8-penny cut steel flooring nails, 12 to 16 inches apart.
25/32 inch.....	7-penny or 8-penny cut steel flooring nails, not over 16 inches apart.
¾ inch.....	4-penny cut steel flooring nails (or 3-penny), 9 inches apart.



In the manufacture of hardwood flooring it is the usual practice to cut shallow grooves in the under side of each flooring strip. This process, which is known as hollow-backing, has several advantages.

First, any tendency toward cupping is materially reduced. Next, a better bearing is secured for this flooring than if flat-backed flooring is used. Also, the routing of hollow-backed flooring affords a space for slivers and dirt that might interfere with a firm bearing. In addition, the

pancies. Each of these thicknesses can be obtained in five different standard face widths— $1\frac{1}{2}$ ,  $2\frac{3}{8}$ ,  $3\frac{1}{4}$ ,  $4\frac{1}{4}$ , and  $5\frac{3}{16}$  inches, each with a tongue  $\frac{1}{4}$  inch wide. A narrow face presents a finer appearance than a wide face, but on account of the greater waste and labor, is more expensive. The  $2\frac{5}{32}$  inch flooring is probably the most popular of the three light duty sizes, although the  $1\frac{1}{16}$  and  $1\frac{5}{16}$  inch thicknesses are in demand where the service is to be more severe than usual.

These strip floorings are furnished in the form



*Courtesy Mattie E. Hewitt Studios*

*Beautifully grained strip flooring laid diagonally has made colorful and attractive this attic room.*

shipping weight is reduced, and the finished face can be easily identified.

### Softwoods

The various softwoods previously mentioned as suitable for flooring are manufactured in three standard thicknesses,  $2\frac{5}{32}$ ,  $1\frac{1}{16}$ , and  $1\frac{5}{16}$  inches, for use in residences and in other light duty services, such as stores and business occu-

of edge or vertical-grained and in flat-grained lumber, each form coming in from two to seven different grades. Consequently, the builder or home owner has available a choice wide enough to fulfill every need or requirement at a price to fit any pocketbook. The particular grade to be used for any specific purpose will depend somewhat on the relative cost, and on the conditions of service.



Edge-grained flooring, cut radially across the annual rings, is more resistant to wear, but also costs more to manufacture than flat-grained material which is cut more or less tangentially to the growth rings. The difference in wearing qualities is due to the greater proportion of the hard summerwood (the dark part of the annual growth ring) exposed when the wood is cut edge-grained than when it is flat-grained.

Another distinction in some species is made between all heartwood flooring and flooring in which sapwood is permitted. In structural timbers exposed to the weather such a distinction is made because of the superior durability of heartwood (the inner or inactive portion of the tree) over sapwood (the outer and growing part). For inside flooring, however, where no appreciable amount of moisture is normally encountered, the all-heart grades have no particular advantage over the other grades from a standpoint of serviceableness. All-heartwood is specified in the better grades of certain species to avoid the color

difference between the heartwood and the sapwood.

Softwood flooring is divided into two general classes—the Select grades, designated by the letters A, B, C, and D, and the Common grades, designated as Number 1 Common, No. 2 Common, and No. 3 Common.

The upper Select grades—i. e., A, B, or B & Better—are used where a fine appearing finish is desired. These grades may be stained, varnished, or waxed to suit the individual taste.

The lower Select grades—i. e., C and D—are used where a limited number of small, obscure defects will not be objectionable. These grades are usually heavily stained or, in some cases, painted.

The upper Common grades, No. 1 and No. 2 Common, are primarily utility grades, and find an extensive field in sub-floors, or in finish floors subject to rough usage. The following table gives a brief description of each grade and the type of use for which it is best adapted.

#### SOFTWOOD FLOORING GRADES

Grade	Quality	Chief Uses
A Select . . . . .	Practically clear of all defects.	Highest quality for fine residences, etc., where large, uncovered beautiful finished surfaces are desired.
B Select . . . . .	Small defects, practically unnoticeable, principally knots or minute pitch pockets and slight manufacturing defects. In many species it is combined with some "A" grade material to form a "B & Better" grade.	Used for high-class residential and office finished flooring. When waxed or shellacked, has an appearance of practically a clear grade.
C Select . . . . .	Contains slightly more and larger defects than B Select, but not exceeding medium in size or character.	Excellent for dark stained or heavily varnished or painted finishes which will conceal the defects, or satisfactory where scatter rugs are used.
D Select . . . . .	More and larger defects than in C Select, none causing any waste or detracting from a finished appearance when painted.	For painted finishes or covered uses, where defects will be of no consequence.
No. 1 Common..	Tight knotted, sound stock with size of defects and blemishes limited; not necessarily as perfectly manufactured as Select grades, but always usable without any waste.	An excellent utility flooring for kitchens, summer cottages, attics, playrooms, etc.; also for railroad stations and shelters permitting painted finish.
No. 2 Common..	Allows somewhat larger and coarser defects than No. 1 Common; mostly tight with occasional loose knots, discolorations and manufacturing imperfections, but usable without waste.	Used chiefly for sub-flooring or as an economical flooring where utility is the consideration.
No. 3 Common.. or No. 3 Common Sheathing	Allows larger and coarser defects than No. 2 Common, with occasional knot holes, decay, and wane. Permits some waste in its use.	Chiefly for temporary construction.



A list is given below of the various softwood species from which flooring is manufactured. The grades available in each species are also shown for both flat and edge-grained stock.

### Grade-Marking

An ever-increasing quantity of wood flooring is being manufactured with the name of the species and the quality or grade stamped on each

SPECIES	FLAT-GRAINED		EDGE-GRAINED
	SELECT GRADES	COMMON GRADES †	
Cedar, Incense .....	B & Better, C, D.	No. 1, No. 2, No. 3.	
Cedar, Western Red <sup>1</sup> .....	B & Better, C.		
Cypress, Red <sup>1</sup> .....	A (All Heart), B, C, & D.		
Douglas Fir, Coast Region <sup>2</sup> .....	B & Better, C, D.		A, B, C, D.
Douglas Fir, Inland Empire and California <sup>3</sup> .....	B & Better, C, D.	No. 1, No. 2, No. 3.	B & Better, C, D.
Fir, White .....	B & Better, C, D.	No. 1, No. 2, No. 3.	
Hemlock, Eastern .....	D & Better.	No. 1, No. 2, No. 3.	
Hemlock, West Coast .....	B & Better, C, D.		A, B, C, D.
Larch, Western .....	C & Better, D.	No. 1, No. 2, No. 3.	C & Better, D.
Pine, Longleaf and Shortleaf Southern .....	A, B, C, D.	No. 1, No. 2, No. 3 Sheathing.	A, B, C, D, No. 1, No. 2.
Pine, North Carolina .....	B & Better.	No. 1, No. 2, No. 3 Sheathing.	B & Better, No. 1, No. 2.
Pine, Northern White .....	D.	No. 1, No. 2, No. 3.	
Pine, Norway .....	D.	No. 1, No. 2, No. 3.	
Redwood, California <sup>1</sup> .....	Clear Heart, A, B.		Clear Heart, A, B.
Spruce, Eastern .....	D.	No. 1, No. 2, No. 3.	
Spruce, Sitka .....	B & Better.		B & Better.
Tamarack .....	D & Better, D.	No. 1, No. 2, No. 3.	

† The common grades are known as No. 1 Common, No. 2 Common, No. 3 Common or No. 3 Common Sheathing; and not simply as No. 1, No. 2, and No. 3 or No. 3 Sheathing.

<sup>1</sup> The light flooring use of these woods is confined principally to porch or other exposed flooring areas, although cypress is now being manufactured in built-up end-grained blocks for interior floors. (See page 29.)

<sup>2</sup> Graded under rules of West Coast Lumbermen's Association.

<sup>3</sup> Graded under rules of Western Pine Manufacturers Association and California White and Sugar Pine Manufacturers Association.

Softwood floors of the customary 25/32-inch thickness used in residences should be side-nailed with 8-penny cut flooring nails, spaced not more than 10 inches apart and driven at the usual angle of about 45° to avoid splitting the flooring.

**Amount of Flooring Required.**—The number of board-feet to be purchased is determined by adding to the floor area the following percentages:

#### Thickness

25-32 inch .....	Add 27% for 2 3/8-inch width.
	Add 23% for 3 1/4-inch width.
	Add 15% for 5 3/16-inch width.
1 1-16 inch .....	Add 58% for 2 3/8-inch width.
	Add 54% for 3 1/4-inch width.
	Add 43% for 5 3/16-inch width.
1 5-16 inch .....	Add 90% for 2 3/8-inch width.
	Add 85% for 3 1/4-inch width.
	Add 72% for 5 3/16-inch width.

An additional allowance of 3% to 5% is desirable for waste in cutting and laying.

piece. In addition, many of the larger producers are now adding the National "Tree-Mark", indicating that each piece is financially guaranteed by the National Lumber Manufacturers Association to be of the correct finished size, and to be of the species and quality stamped. As a result, the architect or builder can be assured that he is obtaining the exact kind and grade of wood specified. Wood so marked is known as grade-marked, Tree-Mark lumber, and can be secured on specification from modern lumber dealers.

### Certification of Quantity

In addition to grade-marked, National Tree-Mark lumber, lumber manufacturers now furnish added protection to buyers of carload shipments. This consists of "Shippers' Certificates of Car Contents" in case of softwoods, and "Licensed Shipments" in case of hardwoods. Such certificates





*John Alden House, built in 1653. Pine floors and paneling; oak timbers.*



guarantee the exact contents of the shipment in terms of species, grades, items, and footage. They can be used by manufacturers only under authority of a recognized lumber manufacturer's association. They are enclosed in sealed water-proof envelopes, are fastened within the car, and are to be delivered unopened to the buyer's purchasing department immediately upon breaking the car seals and before the car is unloaded.

Carload buyers should insist upon "Shippers'

One important function of the sub-floor should be to bear the tracking back and forth of carpenters, plasterers, plumbers, and other artisans who are putting the finishing touches on the structure. The finish floor should not have such traffic imposed upon it, any more than should a costly carpet.

It is poor practice, furthermore, to buy high-grade, carefully seasoned flooring and put it in a building with several tons of wet plaster, or even



*Courtesy The Mott Studios*

*An example of the combined charm of woodwork and flooring. The dark border strips lend the final touch of artistry.*

Certificates" or "Licensed Shipments," as well as upon grade-marked lumber, and thus be fully protected in the lumber actually received.

#### LAYING AND FINISHING

The application of the finish floor should be deferred until the house or building is completed.

in a masonry or concrete structure that has not yet dried out. Carelessly installed in this fashion, the flooring may absorb too much moisture from its surroundings. The boards swell, and not infrequently the floor bulges and its serviceableness is permanently impaired.

Not until the plaster has thoroughly dried out,



and the house is otherwise ready for occupancy, is it time to lay the finish floor. Precautions which should be observed are to open all windows and to keep the heating plant going for from ten days to two weeks before the finish floor is laid. In any kind of a brick, concrete, or stone building a still longer heating period should be allowed on account of the greater dampness inherent in such types of buildings.

### How to Lay the Floor

The baseboard will already be in place, its lower edge level with, or slightly above, the surface of the top floor. The first strip of flooring is then lined up and nailed flush with the face of the baseboard. This first course is face-nailed, the nails being driven so that they will later be hidden by the quarter round or shoe moulding. By keeping the lower edge of the baseboard at the finished floor level, and by laying the floor so that it does not extend under the baseboard, it becomes an easy matter to nail the shoe molding to the sub-floor through the crack between the baseboard and the finished floor. (See Fig. 4.)

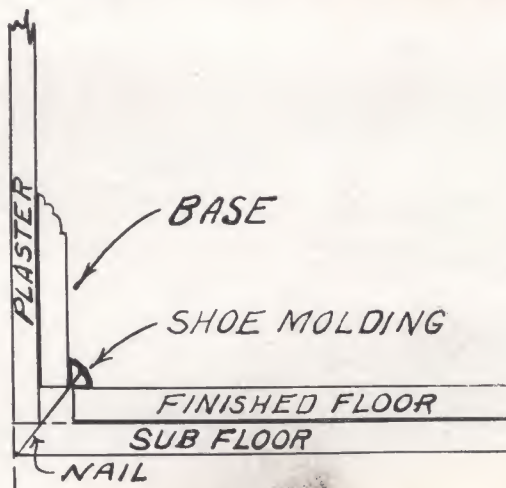


Fig. 4.

Consequently, any movement of either the baseboard or the flooring, due to seasonal moisture changes, will not affect the shoe molding and so will not open up unsightly cracks along it.

The strips are then laid in order and driven up tight, carrying each course clear across the room before the next is begun. A careful carpenter will always use a short piece of flooring or a special tool for this purpose, rather than hammer directly against the strip. The finished floor is designed to be as beautiful as the wood in a piece

of handsome furniture. It should be handled with the same respect while it is being laid.

Block floors for residences or offices are often set in mastic, which prevents any moisture absorption from beneath, and laid directly either on a matched sub-floor, or, if in a concrete and steel building, on the concrete floor slab.

### Wood Floors on Concrete Base

In many hotels, office and industrial buildings of the so-called fire-resistive type, concrete sub-floors, reinforced with steel, are obligatory. For beauty and comfort these floors must be covered. The merits of wood for the finish flooring are just as noticeable here as for the smaller residential building. Other methods of laying the wood floor, however, are utilized.

For reasons already given, a sound precaution is to be sure the concrete has had a chance to dry out thoroughly before the floor is laid no matter what the construction.

One method in common use is to set wood "sleepers" about 16 inches apart, in the concrete, to act as nailing surfaces for the wood floor. These sleepers are about 2 inches wide on top and 3 inches at the bottom and are usually fastened securely with clips embedded in the concrete. The nailing strips also are often embedded in concrete, or a cinder fill is added between the concrete sub-floor and the wood floor. Where this involves exposure to dampness the strips should be given a light treatment with a preservative solution such as zinc chloride or sodium fluoride. This will prevent any chance of decay.

It is also advisable before placing the cinder fill between sleepers to cover the concrete with a thin, even coating of coal tar pitch or other damp-proofing compound, in order that no moisture can get at the wood floor from below.

It is good practice to lay a wood sub-flooring on top of the sleepers and to place the finished floor over this. Often, however, for the sake of economy, the finished flooring is laid directly on the sleepers without any sub-flooring, in which case the butt ends of the floor strips must meet over a sleeper.

Another method of laying wood floors over a concrete base is the application, directly onto the concrete, of a waterproof layer, consisting of a mop coat of pitch, two layers of tarred felt lapped 17 inches and thoroughly mopped, and a final



smooth coat of pitch. On this surface the wood strips or blocks are placed. The concrete slab must be uniformly and smoothly finished.

### How the Wood Floor Should be Finished

An endless variety of finishes for wood floors has been used with satisfactory results. The best method for any particular floor will depend on personal preferences, actual service conditions, and to a large extent the workmanship and qual-

Machine sanding is usually less expensive, but not always so satisfactory as hand work.

**Stains.**—Oil stains are generally preferred to water stains or acid stains. They are available in different colors to suit any taste or desire, and to match any woodwork. When a stain is to be used, it should be applied immediately after the scraping process.

**Fillers.**—These are used in open-grained woods after the sanding process, to fill the grain and



*Courtesy Oak Flooring Manufacturers Assn. of the United States*

*Laying hardwood floor on wood sleepers set in concrete sub-floor. Building paper is placed under the wood floor to prevent absorption of moisture from the concrete beneath.*

ity of finishing materials used. Experience has demonstrated, however, that some form of protective treatment is necessary.

**Surfacing or Scraping.**—When the floor is laid and ready for finishing, it should be carefully sanded, rubbed with steel wool, or scraped to insure a smooth, polished surface. Then it should be swept and wiped clean of all dirt and dust.

provide a base for the varnish or wax. Only paste fillers, as distinguished from liquid fillers, should be used. Where a colored stain has been used, the filler should have the same color.

If a Southern pine floor is laid properly, fillers will not be needed, as the wood is dense and compact. If any cracks or checks appear in the sur-



face, however, they should be filled with a good paste filler.

Oak floors nearly always are treated with a paste filler, which is allowed to dry for at least twelve hours before the shellac or varnish is applied.

#### Varnish, Shellac or Wax?

After the floor has been sanded, and the stain and filler applied, if found desirable, the question arises as to the use of shellac, or varnish or wax for the finish coating. Some advocate one type while others may recommend a combination.

Southern pine users offer a choice but recommend for finishing Southern yellow pine floors in residences a coat of the best white shellac, followed by two coats of first-class floor varnish. The same treatment has been found effective for Douglas fir and other softwoods.

For maple, birch and beech, the manufacturers recommend three coats of varnish, or else a wax finish applied after the filler. The use of shellac under varnish on a *natural* finish of the wood does not give a thoroughly pleasing effect.

For oak, wax seems to be the preferred finish, being applied directly over the filler, or else over the filler and two coats of shellac. A wax finish has the advantage of being easily renewed wherever spots that show wear may occur, whereas varnish shows scratches and can not be touched up without showing brush marks. If varnish is considered desirable, either one or two coats may be used, directly over the filler.

#### PORCH FLOORS

These may be built of almost any softwood, although in view of their exposure to air and moisture, they should preferably be heartwood of one of the more durable woods, cedar, cypress, or redwood or of the dense heartwood of Douglas fir, Southern yellow pine, or Western larch.

The porch floor joists should run parallel to the front of the house in order that the floor strips may run across them and drain away from the house.

In northern localities, where heavy snowfalls are the rule, it is quite common practice to lay the porch floor with open joints—i. e., leaving about  $\frac{1}{4}$  inch between adjacent strips to facilitate draining. In other sections, where matched lumber is used, the joints are filled with white lead and driven tight.

In either case the floor should be either painted or treated with an oil preservative to protect the wood from too rapid changes of moisture. The under side of the porch should be left open to permit ventilation and prevent decay of the framing.

#### Canvas Decking

It occasionally develops, because of a room underneath, that a porch floor must be waterproofed. An extremely effective method of obtaining this waterproofing is the use of a canvas deck on top of the porch floor.

There are few builders, and comparatively few architects who are familiar with the proper method of laying a canvas deck. A poor canvas deck is an abomination; a good one is perhaps the best protective floor covering known. Canvas is commonly used on ships' decks which have to be weathertight.

The canvas should first be thoroughly soaked in water and then partly dried out by wringing, either by machine or hand, as with a wet towel or sheet. At the same time the deck or floor should be covered with a thick coat of white lead and oil. The canvas should then be stretched immediately as tightly as possible over the wet paint and secured in place with copper nails about  $\frac{3}{4}$  inch apart along the edges. As soon as this nailing is done, a coat of linseed oil should be applied.

If the canvas is not wetted before being placed, it absorbs too much of the first paint coat and so does not adhere to the wood surface underneath. Wetting the canvas, however, causes it to shrink as it dries out, and draws it taut to a smooth hard surface.

This method practically cements the canvas to the floor. It is obvious, of course, that all unevenness in the wood floor should first be removed by scraping.

When the first coat of paint has dried, it should be followed by a sufficient number of coats of suitable deck paint to fill completely the pores of the canvas. Usually two or three coats will be required.

#### RESURFACING OLD FLOORS

Many people have found themselves with old, stained or discolored floors and have wondered how such floors could be renovated or replaced in an easy and economical manner.

One of the simplest, cheapest and most satisfactory methods is to lay a new floor over the old





Courtesy Mattie E. Hewitt Studios

*The broad oak floor planks add the necessary tone to the massive timber of this billiard room.*



one. The thinnest pattern of hardwood flooring often is used for the purpose.

Maple, birch, beech, and oak are all manufactured in  $\frac{3}{8}$ -inch thickness; oak flooring is made also in a  $\frac{5}{16}$ -inch thickness. These thin floorings can be laid easily, without any more disturbance to the occupants of the house than would be caused by laying a carpet. The only precautions to be taken are to have the old floor dry and

Sometimes it is desired to repaint a wood floor where the old paint surface is loose or badly cracked and chipped. It becomes necessary then to remove the original paint.

Probably the most efficient method is by burning with a painter's torch, but great care must be exercised on account of the fire risk. The heat softens the paint which is easily scraped off. A



*Courtesy Maple Flooring Manufacturers Association*

*A floor in the new Capwell Building, Oakland, Calif. Northern hard maple strip flooring was cut to length on the job and laid in mastic. Haldane S. Fisher, Architect*

structurally sound, and to have it uniformly smooth and level so that the finished floor surface will also be smooth and level. Such a flooring will not cost any more than a good carpet and with ordinary care will last throughout a lifetime.

Dark stain can then be applied to cover up any slightly scorched places on the floor.

Another good method is to use a sanding machine, after which staining is also recommended. Some people prefer to use a commercial paint



and varnish remover, which must be washed off with benzine, after the paint is removed; others use a caustic soda solution, but this is injurious to the skin and also raises the grain of the wood.

Consequently, it is necessary to wash the surface with water, then vinegar and again with water. After the floor has dried it should be sandpapered before being repainted.



*Courtesy Southern Cypress Manufacturers Association*

*Attractive flooring pattern of four 6-in. square blocks built up of smaller pieces set on end. (See page 17.)*



More detailed information on different wood floorings may be obtained from the following organizations:

Each of the ten lumber manufacturers associations listed on the opposite cover page.

Appalachian Hardwood Club, Southern Railway Building, Cincinnati, Ohio.

Arkansas Soft Pine Bureau, Little Rock, Ark.

Cellized Oak Flooring, Inc., 605 Union & Planters Bank Building, Memphis, Tenn.

Maple Flooring Manufacturers Association, McCormick Building, Chicago, Ill.

Oak Flooring Manufacturers Association of the United States, 228 N. La Salle Street, Chicago, Ill.

The National Committee on Wood Utilization's Recent book on "Wood Construction," published by the McGraw-Hill Book Company, New York, N. Y.; price, \$6 per copy. Contains considerable up-to-date information on wood floors.



## WHERE ADDITIONAL SPECIFIC LUMBER INFORMATION MAY BE OBTAINED

**A**S the publications of the National Lumber Manufacturers Association deal with lumber in general, it is suggested that those desiring additional information regarding the respective species of woods listed below should make requests for definitions, grading rules, and publications concerning the special advantages and characteristics of each species to the following member associations affiliated with the National Lumber Manufacturers Association:

CALIFORNIA REDWOOD ASSOCIATION,  
San Francisco, Calif.  
*Redwood*

CALIFORNIA WHITE AND SUGAR PINE  
MANUFACTURERS ASSOCIATION,  
San Francisco, Calif.  
*Sugar Pine, California White Pine, White Fir,  
Douglas Fir, Incense Cedar*

HARDWOOD MANUFACTURERS INSTITUTE,  
Memphis, Tenn.  
*Ash, Basswood, Beech, Birch, Cherry, Cypress, Chestnut,  
Cottonwood, Elm, Gum, Hickory, Maple, Magnolia,  
Oak, Poplar, Sycamore, Tupelo, Willow, Walnut,  
Tennessee Aromatic Red Cedar*

NORTH CAROLINA PINE ASSOCIATION,  
Norfolk, Va., and Macon, Ga.  
*North Carolina Pine*

NORTHERN PINE MANUFACTURERS  
ASSOCIATION,  
Minneapolis, Minn.  
*Northern Pine*

NORTHERN HEMLOCK AND HARDWOOD  
MANUFACTURERS ASSOCIATION,  
Oshkosh, Wis.

*Hemlock, Birch, Maple, Basswood, Elm, Ash, Beech,  
Tamarack, White Pine*

SOUTHERN CYPRESS MANUFACTURERS  
ASSOCIATION,  
Jacksonville, Fla.  
*Cypress, Tupelo*

SOUTHERN PINE ASSOCIATION,  
New Orleans, La.  
*Longleaf and Shortleaf Southern Pine*

WEST COAST LUMBERMEN'S ASSOCIATION,  
Seattle, Wash., and Portland, Oreg.  
*Douglas Fir, West Coast Hemlock, Sitka Spruce,  
Western Red Cedar, Port Orford Cedar*

WESTERN PINE MANUFACTURERS  
ASSOCIATION,  
Portland, Oreg.  
*Pondosa Pine, Idaho White Pine, Larch, Douglas Fir,  
White Fir, Cedar and Spruce*

### NATIONAL LUMBER MANUFACTURERS ASSOCIATION

Transportation Building  
Washington, D. C.

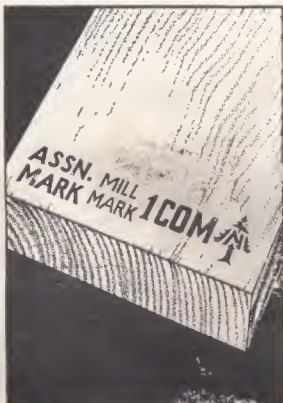
#### FIELD OFFICES

New York	Chicago	San Francisco
Boston	Indianapolis	New Orleans
Pittsburgh	Minneapolis	
	Kansas City	Memphis

#### Cooperating Organizations

British Columbia Loggers Association.  
British Columbia Lumber & Shingle Manufacturers Association.  
Maple Flooring Manufacturers Association.  
National-American Wholesale Lumber Association.  
National Association of Wooden Box Manufacturers.  
Oak Flooring Manufacturers Association of the United States.  
Red Cedar Shingle Bureau.  
Service Bureau—American Wood Preservers Association.

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